

is that birds, if they feed on insects to the extent shown in this instance, must play a much more important part as checks on the numbers of insects than many people have hitherto believed.

Stomach examination has shown that a considerable percentage of the food of the western meadowlark is made up of ground beetles, these insects being eaten every month of the year. The harm done in destroying beetles considered beneficial because of their predacious habits (*e. g.*, *Calosoma*) is in a large measure counteracted by the destruction of certain injurious elaterid (*e. g.*, *D. rasterius*) and chrysomelid (*e. g.*, *Diabrotica soror*) beetles. The stomach of a meadowlark taken at Big Pine, Inyo County, California, November 20, 1911, contained over thirty-six chrysomelid beetles of the species *Diabrotica soror*. In that this species is very destructive in the state, and as insecticides are seldom used as a means of control, any natural means of check becomes of importance, and should be so recognized.

A knowledge of the part played by certain birds in the economy of nature is yearly becoming more important and demands attention, lest the information needed be forthcoming too late. As the fairest test of the value of a bird is dependent on a knowledge of its food habits, the investigation in hand will help to demonstrate the economic value of those birds now considered of doubtful value. The investigation will not stop with a knowledge of the food habits alone, for the life history of each bird and its relation to its environment constitute factors almost as important, which must be considered. The justification of the investigation does not only lie in the increased information as to the food of birds, but in the saner protection which must necessarily follow the knowledge of the use of birds.

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THE MOSAIC DISEASE OF TOBACCO

DURING the past winter an investigation of the Mosaic disease of tobacco was undertaken by the writer. Mosaic has been generally regarded as a so-called physiological disease and it was planned to carry out the investigation along physiological lines. However, certain observations soon brought to light new facts which would seem to throw considerable doubt on former views as to the nature of the malady. It was found that insects are involved in the dissemination of the disease and the Bureau of Entomology has undertaken to follow up this phase of the problem. It will doubtless require considerable time to work out satisfactorily the questions involved, but it is thought desirable to announce the more important facts which have been established regarding this obscure disease.

Susceptibility of other Solanaceous Plants to the Mosaic Disease

Heretofore, no investigator has shown definitely that the mosaic disease of tobacco is communicable to other plants. The writer, however, has readily transferred the disease from tobacco to a great variety of solanaceous plants. By inoculation the disease has been obtained in plants of the following genera: *Nicotiana*, *Lycopersicon*, *Petunia*, *Physalis*, *Datura*, *Hyoscyamus*, *Solanum* and *Capsicum*. A mosaic plant of the species (*Solanum carolinense*) brought to the writer's attention, indicates that the mosaic disease of tobacco sometimes occurs in strictly wild plants.

Efforts to inoculate the common potato (*Solanum tuberosum*), the eggplant (*Solanum melongena*) and belladonna (*Atropa belladonna*) were without success. Among the species of *Nicotiana*, it has not yet been possible to develop the disease in the species *N. glauca* and *N. viscosum*.

Appearance of the Blossoms of Mosaic Tobacco Plants

The development of mosaic in all varieties of *Nicotiana tabacum* usually affects the in-

tensity and distribution of the pink coloration of the corollas in much the same manner that it affects the intensity and distribution of the green color of the leaves. For this reason an examination of the blossoms often affords one of the surest indications of the presence of mosaic in a tobacco plant. So far as the writer is aware, this distinctive appearance of the blossoms has not before been mentioned.

Specific Infection Apparently Responsible for the Development of Mosaic

The writer's experiments do not bear out the conclusions of earlier investigators that a true, infectious mosaic can be produced in plants by simply cutting them back.

If the infectious principle of mosaic is not accidentally introduced during the course of the experiments, and if the plants are absolutely free from the disease at the time of cutting, our experiments indicate that these plants may be cut back indefinitely without producing mosaic. Healthy plants have been constantly cut back, in some instances for long periods, without producing any symptoms of true mosaic. This was not accomplished, however, until thorough methods of sterilizing were observed, and the plants had been carefully screened and fumigated to exclude aphids.

Soil Infection

All experimental data at hand indicate that soil infection is not as important a factor as has been supposed in the origin of mosaic in the seed bed. In many experiments it has been shown beyond question that an outbreak of mosaic in young plants was not in any way connected with soil infection.

Aphids as Carriers of the Mosaic Disease

In the course of the writer's greenhouse experiments with tobacco, it was observed that the occurrence of mosaic in plants at various stages of development was in some manner frequently associated with aphid infestation.

Under control conditions it was observed that healthy tobacco plants were always obtained if these were grown in screened cages

fumigated at short intervals to prevent aphid infestation. On the other hand, when colonies of aphids present in the greenhouse were introduced into other cages containing healthy plants, infestation of the plants resulted in a wholesale occurrence of mosaic. This phase of the question has been taken up in cooperation with the Bureau of Entomology.

Following inoculation a somewhat variable inoculation period preceded the first symptoms of mosaic. This period and the subsequent symptoms appear to be practically the same in whatever manner the disease may be communicated to healthy plants.

In the light of the facts brought out in our experiments, it is not easy to see how the mosaic disease of tobacco can be logically placed in the category of purely physiological diseases. These facts strongly suggest the presence of a living, active microorganism.

It has been suggested at various times that the pollen grains may be the carriers of a mosaic disease. Earlier investigators have shown (and the writer has substantiated these results) that the seed of mosaic plants produces healthy plants. As a matter of fact, the general rule of self-fertilization of the tobacco flower means that the pollen grain and ovules are both produced by a mosaic plant. These facts are not favorable to the pollen-grain transmission of the disease.

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*THE CONVOCATION WEEK MEETING OF
SCIENTIFIC SOCIETIES*

THE American Association for the Advancement of Science and the national scientific societies named below will meet at Cleveland, Ohio, during convocation week, beginning on December 30, 1912.

American Association for the Advancement of Science.—President, Professor Edward C. Pickering, Harvard College Observatory; retiring president, Professor Charles E. Bessey, University of Nebraska; permanent secretary, Dr. L. O. Howard, Smithsonian Institution, Washington, D. C.; gen-